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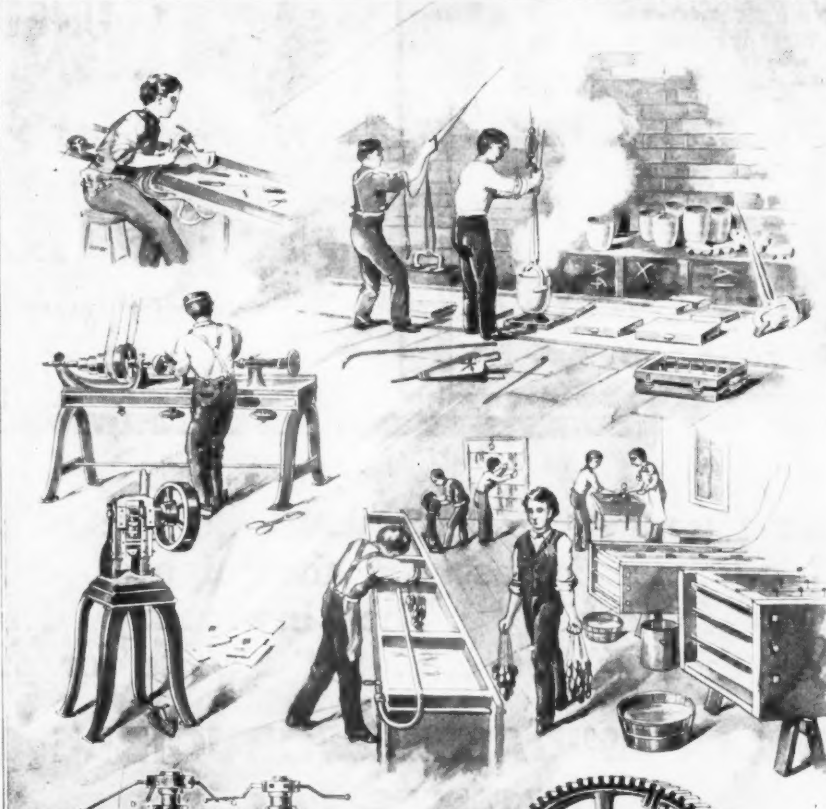

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LABOR OMNIA VINCIT
OCTOBER, 1904

BRONZE

NEW YORK.

61 BEEKMAN ST.

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THE METAL INDUSTRY

WITH WHICH ARE INCORPORATED THE ALUMINUM WORLD, THE BRASS FOUNDER AND FINISHER AND ELECTRO-PLATERS REVIEW.

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METHOD OF MAKING ALLOYS.

The "secrets" of the manufacture of mixed metals, either in the forms of rolled metals or sand castings, are gradually being revealed in one way or another, but there are yet some people who believe that there is much in the way of mixing metals in order to obtain the necessary results. There are those who believe that if tin is added before the lead or the zinc before the tin or in any other manner except in the way in which they have been accustomed to do it, that the results will not be as good. We occasionally hear of metal mixers who add the tin and lead to a composition metal in the form of a mixture of these two metals and they really believe that, should they introduce the metals in any other manner, that they would lose their customers.

There is also the other extremist who does not believe that there is any need of a mixture of any particular proportions and his work usually shows it, as he is the clear scrap man and puts in anything which comes along. While the other fellow weighs with extreme accuracy and mixes his metals with precision and in exactly the same manner from day to day, this one uses anything which comes along. Examine his work and ascertain for yourself whether his judgment is good. We have always advocated the use of scrap metals where they can possibly be used, but it is our firm belief that anyone, in order to use scrap to its best possible results must understand the mixing of metals in the best manner that can be done. He then will know what the scrap contains.

There are certain rules to be laid down in the mixing of metals which may be called "common sense" rules, and if the melter will follow them he will get good results. He will not need to know whether his competitor melts his tin and zinc together or his lead and tin before making composition or whether, like the old recipe for making soft soap, it is stirred with a sassafras stick. Common sense will tell the melter that it would scarcely do to melt the copper and zinc together if much of the zinc is to go into the alloy and not up the chimney. In the same manner his intuition will indicate that it is always better to melt the high melting metals first and add the low melting ones last. Zinc is generally added after the copper is melted, but it need not be, as the results are the same whether it is introduced before or after the tin or lead.

There is no doubt that making up an alloy of the tin, zinc and lead for use in composition is good practice, as it

renders the operation more or less "fool proof," but the results obtained in the castings are no better than are obtained if added singly. When the question is asked of the melter why certain things are done in the mixing of metals and he replies that "It is one of the secrets of the business," do not take very much stock in it, but see if just as good castings cannot be made without the "secrets."

SCRAP METALS IN ENGLAND AND UNITED STATES.

The condition of the scrap metal business and the prices paid for scrap metals have greatly changed within the last decade, and so much competition has entered that there is supposed to be little profit in the business at the present moment. The history of the scrap metal business in the United States would form interesting reading and would show the volume of wealth which was thrown away in the "dump" and the amount of money made by the large scrap metal dealers in the early days of the industry when an investment of even a few dollars brought back returns of hundreds, and, indeed, cases are on record where thousands were made with a similar investment. Instances are known where such materials as copper scale, the richest of all the copper bearing materials, was actually thrown upon the dump, as there seemed to be no market for it. The condition has now changed, however, and it is believed that there are no such "bargains" to be obtained like those of former times.

The metal dealer of to-day believes that he now pays the very highest price which can be paid for materials of the scrap nature and still make any money in his business, and it is interesting, therefore, to see a comparison between the prices paid in England for the same material that is used in the United States. It has been known for a long time that metal dealers could export copper bearing materials from this country to England and still make money upon them, and the following prices will serve to illustrate the fact that there is money in doing it. These prices are given us by one of the largest scrap metal dealers in England and represent the prices paid by him for material offered. The prices paid in the United States are from a similar large dealer and represent the market price.

	Price in United States.	Price in England.
Heavy copper.........	11.25c. per lb.	12.40c. per lb.
Heavy brass	7.50c. " "	8.50c. " "
Zinc	3.62c. " "	4.20c. " "
Lead pipe............	3.95c. " "	2.50c. " "
Tea lead..............	3.70c. " "	2.25c. " "
No. 1 pewter.........	18.00c. " "	19.50c. " "

It will be seen that there is a large difference in price in everything except lead, which is lower in England. The difference in price of the commodities, such as a heavy copper and brass, seem to be of sufficient importance to warrant the scrap metal dealers' attention. There are several who make a business of exporting large quantities of material and with apparent profit. The difference in price more than pays the freight and leaves considerable margin besides. The disadvantage of doing business in foreign countries has to be taken into consideration.

Why this difference exists we cannot say, but it seems to be so in all classes of materials. We even know of concerns sending silver sweeps to Birmingham, England, and for a long time nearly all the zinc dross produced in the United States has been shipped to Swansea, Wales. These matters set us thinking.

THE INCREASING POPULARITY OF THE FRENCH-GRAY FINISH.

It is seldom that a fad exists more than one season. The popularity only lasts a sufficient length of time to enable the manufacturer to dispose of his stock of goods. The fad then passes into the background. This statement is quite true of the various finishes which are applied to metals wrought into wares used for ornamental purposes. Many finishes have appeared upon the market only to pass out of existence in one season. They soon are forgotten, and, perhaps, at some future time to be "discovered" and once more put upon the market.

The French-Gray finish for silver appears to be an exception to this condition. Making its appearance as it did a few years ago, ware bearing it was placed upon the market somewhat cautiously by the various flat and hollow ware manufacturers in order that the fickleness of the public might be carefully tested. This finish has now gone through several seasons, and the present one indicates that the amount of goods with it, both sterling and plated ware, which will be placed on the market must be more than ever before. The pleasing character of the finish is, of course, responsible for the continued popularity and indicates that the public appreciates a really artistic and beautiful finish. The dark background which is imparted to the silver by the French-Gray finish, relieves the dazzling monotony of the bright metal. Bright surfaces are rarely pleasing, and to exist in a state which is, beyond doubt, the most artistic, the French-Gray finish must be accompanied by the use of pumice stone in order to obtain that matt and dull surface which, unlike a bright surface, gives no false reflections. From the present popularity of this finish it would seem that it has actually become a standard one and for all time.

An increase of nearly 300 per cent. in the production of graphite in the past decade is shown by the census report upon this industry, just completed by the Census Bureau. During the past decade nearly all the domestic graphite has been obtained from the Ticonderoga mines in Essex County, N. Y. The mines in Chester County, Pa., reopened in 1897, after a period of inactivity, have been in continuous operation ever since. No graphite mined in the United States is fit for the manufacture of crucibles.

THE REVIVAL OF PEWTER.

By Frederick C. Stanley.

The revival of pewter is an example of one of those fads which makes its appearance upon the metal horizon with surprising regularity. The craze for antique wares of every description is, of course, responsible for the recent advent of pewter and, like others of the same nature, it is quite probable that it will not remain long but soon disappear and be forgotten. The recent examples of pewter wares will be relegated to obscure places only to be resurrected by future generations in exactly the same manner that the pewter of our ancestors has been brought forth at the present time. As pewter can scarcely be called a useful metal, on account of its inferiority when compared with the other materials which have taken its place, it is probable that, as a useful alloy, there is little future in store for it. As a thing of beauty, a pewter article is directly dependent upon the artistic value of its design and the care with which it will be preserved must certainly lie within this point. A Tiffany, by his artistic hand, could make a beautiful design in any material and works of art in metals otherwise than noble will be cherished for the work of such a hand rather than on account of the alloy itself. And so it is with pewter. Artistic designs have been put upon the market and have found ready sale. The pewter itself cannot be called the real attraction.

Bronze was the first known alloy, and as this metal is an alloy of copper and tin, it is safe to assume that pewter resulted from an accidental mixture of too much tin with the copper (pewter is composed principally of tin), and as the alloy which was produced possessed toughness and freedom from corrosion, its value became known. It is certain that pewter existed in the early days of Greece and Rome, as examples of the art have been found during excavations and are still preserved in museums on the Continent. The facility, however, with which pewter may be melted has greatly militated against the survival of such ancient examples of Grecian or Roman handicraft. Tin has always been an expensive metal, and there is no doubt but that the pewter which has been found along with other relics of ancient times, is but a small proportion of those which actually existed at that period. History fails to record the transition of the pewter of the earliest civilized period to that of the beginning of the Anglo-Saxon reign, but, from the beginning of the latter period, the information which may be obtained grows more and more exact until even during the reign of the earlier Tudor monarchs much is known about it. During this period, pewter was regarded in much the same manner that sterling silver is considered at the present time and carefully guarded lest it be stolen or lost. The pewter wares of that time were not used for the purposes which might naturally be expected, but were considered more as treasures than articles intended for use. Wooden platters and similar utensils answered all purposes, and the pewter was placed upon the shelf as an article of admiration and emblem of wealth.

As late as the reign of Henry VIII. pewter became more extensively used and the nobility used it for the greater part of their household wares. An inventory of a gentleman's butlery taken during that period is given as comprising "two basins and two ewers of pewter; one ale pot and two wine pots of same, two dozen pewter trenchers; five chargers; seventeen platters; two dozen dishes; sixteen saucers; two porringers; two plates; a washing basin; a salte; and a bottle for water;" all of the same metal. If every family in olden times possessed as full a complement of pewter ware as this it is not surprising that so much old pewter has been handed down by our ancestors. Although the Romish church enjoins that, where people can afford it, silver shall be used for the manufacture of the vessels for the holy offices of religion, many were made of pewter on account of the great disparity in cost. In Germany and also in England, in protestant communities, chalices and salvers of pewter were much used before the introduction of plated ware.

The early workman who wrought the wares of pewter was known as a "Pewterer" and much curious lore exists in regard to the plying of his craft. As far back as Edward III. (A. D. 1348) there existed in the various towns, guilds of pewterers analagous to trades unions so prevalent at the present time. Their object was to prevent the damaging of their trade by the introduction of spurious and imperfect wares, and every means seem to have been taken to prevent such attempts. Rules of the craft provided that all pewter exposed for sale should have first been subjected to assay to determine its purity and any member of the guild detected in the act of selling spurious articles should forfeit the goods. The penalty for the production and sale of goods bearing imperfect workmanship was the same. On this account, rules were

FIG. 1.

drawn up that no work should be done at night, as the flare of the torch or tallow candle resulted in imperfect work. The guild imposed fines upon its members for certain offences and expelled them in instances of certain character. The latter, at the time, was considered equal to outlawry, for unless the offending member was readmitted it became impossible for him to earn his livelihood in the trade. Were he not a member of the guild, he could neither buy nor sell, nor ply his trade.

In 1473, a charter was granted to the Pewterer's Company by King Edward IV. The archives of the guild were still preserved and many new concessions made. One of them was the right of search for inferior goods and metal below the standard of purity. During the year 1533 an act was passed prohibiting the importation of pewter and any article smuggled was to be forfeited and a fine paid. An attempt was made to uphold a high standard of morality and no maker was allowed to say that his goods were superior to another maker. No mem-

ber was allowed to sell pewter purchased second hand, nor was he allowed to repair pewter at any place except his own shop. These conditions existed for some time and attempts were made to still further ramify the trade so that none but those in the guild or union could make the ware, and prices were upheld so that large profits could be made. Action is usually followed by reaction, and the attempts of the pewterers to control the trade and prevent any competition brought into the field a factor which was instrumental in the decline of the art until the trade ceased to exist and the ware almost fell into complete disuse.

About the time the arrogance of the pewterer became most flagrant, earthenware became cheap and new methods of making it became known. This one fact alone is responsible for the passing of the pewterer's art and earthenware has completely replaced pewter. It is absolutely free from any possibilities of food contamination and very much cheaper than pewter. The advent of earthenware produced the fall of pewter, and, although

FIG. 2.

strenuous attempts were made to revive the art, the competition of the cheap earthenware proved to be invincible. The pewterer scarcely realized the slow but steady increase in the displacement of his wares, and, "dying gladiator" that he was, made spasmodic attempts to frustrate the powerful effect of the potters' art, and, during the last year of Elizabeth's reign, a law was passed forbidding country pewterers to enter the shops of London workmen, "Whereby they come to light of further knowledge." Or, in other words, they were obtaining trade secrets. The competition, however, became unsurmountable and the pewterer was obliged to succumb to the inevitable.

In the early days, pewter was an alloy of tin and copper without the admixture of lead or antimony, as these metals had not then been discovered. How long this composition was used I cannot say, but the discovery of antimony placed a material in the pewterer's hands which aided the copper in producing an alloy of lower melting point than can be obtained with copper alone; hence its use. Lead, of course, was added to cheapen the alloy, and, although undoubtedly an injurious element in ware intended for culinary purposes, it has the property of rendering the pewter whiter and freer from that tint for which tin is noted. The detection of lead in pewter with the means at hand during the early days of the pewterer's art, was an impossible operation and hence the unscrupulous maker had every opportunity to adulterate the alloy with it. The question arose at that time about the real danger of the addition of lead to pewter. Tests made seemed to indicate that the introduction of a small amount of lead had no direct influence upon the non-corrosive properties of pewter and cheapened it greatly. At the same time the alloy cast and worked more freely so that laws were passed regulating the amount of lead which could be used in making up the alloy. In France the amount of lead to be added was fixed at 16 per cent., and any amount over this amount was not permissible. Inasmuch as the lead at that time contained considerable silver, which the methods of refining did not remove, it is said that the peculiar whiteness of certain varieties of pewter, made during such a period, is due to the slight admixture of silver. This, however, is quite doubtful, as it has been found that lead itself is capable of whitening the pewter.

Three varieties of pewter were recognized in the early times, viz.: Plate, trifle, and ley-pewter. The first was used for dishes, plates and basins; the second for pints, quarts, and other measures of beer; the third for wine measures and large vessels of all kinds. Plate pewter seems to have changed little in composition from that time to this, as the aim of the maker was the same as it is now, to obtain the greatest hardness with capability of being worked. The best grades contained no lead and examples of such wares may be found. Competition, however, forced the addition of lead and the quality known as trifle pewter resulted. This contained large amounts of lead, often nearly half, but laws regulating the amount to be added were finally passed. The ley-pewter often consisted of nothing but tin and lead and was frequently known as lead-metal. One formula used at that time consisted of 1 cwt. of tin to 26 lbs. of lead. Of course this alloy is simply solder, and with all its softness, but the large vessels into which it was wrought held their shape well. Such a mixture has fallen into disuse and no examples are now found in which such an alloy is employed.

One of the articles of every-day use which has survived the inroads of time and competition of earthenware is the pewter mug, to be found wherever ale or similar beverages are known. It is the constant companion to such familiar beverages. In Fig. 1 is illustrated one of those mugs which was obtained from Germany. It was purchased in the open market and was quite new. It is, therefore, a good example of the German pewterer's art and in order to ascertain what the composition of German pewter is, the following analysis was made of it. The results which I obtained are as follows:

Tin	82.84 per cent.
Lead	10.93 per cent.
Antimony	4.97 per cent.
Copper	1.26 per cent.
Silver	none

This German pewter mug had been cast whole and had not been spun like the pewter used in the example of the American article. The alloy seemed too hard to withstand the necessary rolling operation for the manufacture of sheet.

In Fig. 2 is shown an example of a vase made by a well-known American company, and which is taken as the standard of American pewter. This article had been made from spun sheet and, therefore, it was first

necessary to roll the pewter into sheet. In order to accomplish this the alloy must be soft; hence the composition differs from that of the German alloy in that it is slightly softer. The following analysis was made of the alloy of which this vase was composed. It may be called American pewter:

Tin	85.82 per cent.
Lead	6.14 per cent.
Antimony	7.26 per cent.
Copper	.78 per cent.
Silver	none

It is significant that the metal in the vase appeared to be whiter than that in the mug. Whether there is a certain amount of lead which produces the whiteness is unknown, but it would appear that such is the case.

Pewter differs from Britannia metal in that the latter contains no lead. The transition from one to the other is scarcely perceptible. Indeed, much of the pewter ware sold is really Britannia metal. As there must be some distinction it is generally assumed to be in the lead content.

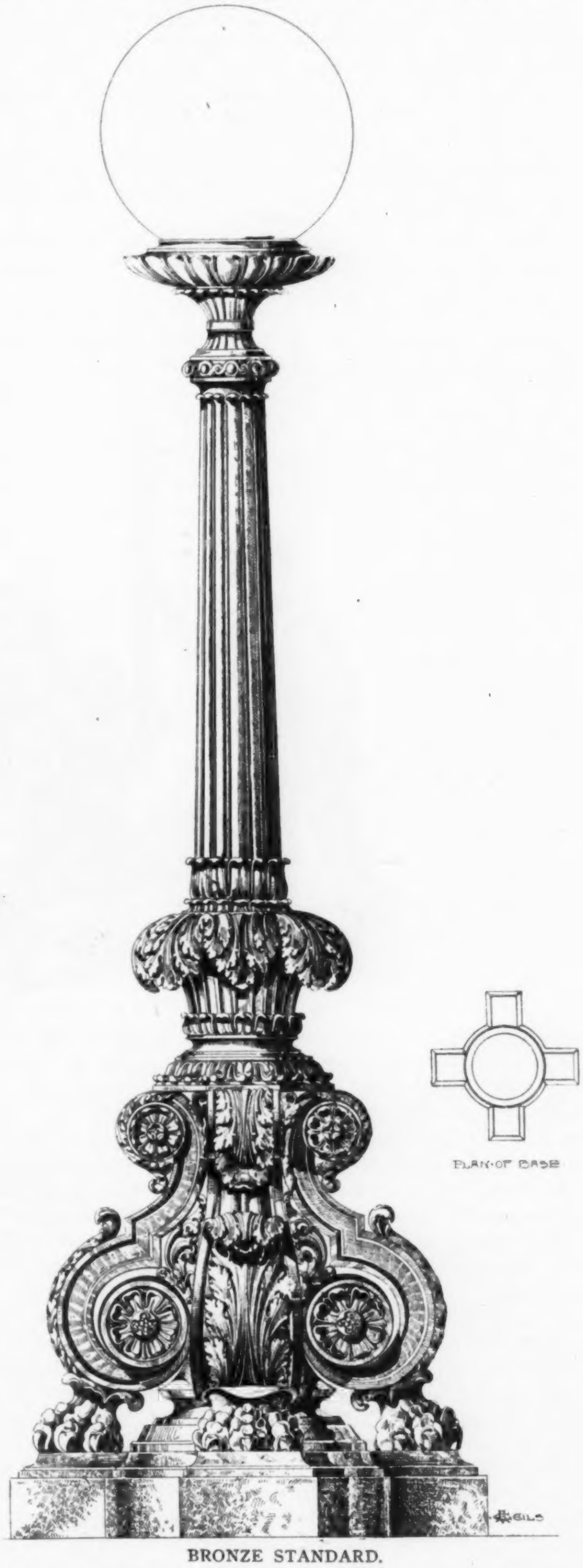
Pewter articles which are not spun are cast, like all soft metals, in brass molds, and the low fusibility and slight shrinkage adapt it admirably for such a purpose. There is not experienced the difficulty of cracking in the mold that is encountered in the casting of spelter. Articles which are spun are made from sheet metal. The metal is rolled through chilled iron rolls in the same manner as brass and the sheet then spun in the usual manner.

BRONZE STANDARD.

The accompanying cut shows a design of a five light electric bronze standard for out of door use. It is to be constructed of solid bronze, and, as can be observed, is of Roman style in design. The lights are to be placed in a ground glass ball at the top. The construction of this standard is of particular interest to metal workers, showing, as it does, the various stages of work which it passes through before completion. After the design has been approved by the architect and owner a full sized drawing is made of it illustrating all details. The drawing is then handed over to the modeler, who produces such patterns as are required. Patterns are first modeled in clay or plasterline, and afterwards modeled in plaster of paris, which is carved and sharpened up ready for the foundry. The patterns are then cast in the desired mixture of bronze. The next step is the fitting and filing, which requires skill and accurate workmanship. The various parts are then scoured and electro colored to any desired shade. They are again fitted. The lamps are wired and the standard is ready for shipment. The design shown in our engraving was drawn by Mr. A. E. Geils, who has made a special study in designing and manufacturing art metal goods. Mr. Geils reports that there is a growing demand in America for all sorts of art metal work.

BRONZE DOORS.

The firm of John Williams have had on exhibition at their foundry, 556 West Twenty-seventh street, New York, the bronze doors which were designed by Mr. French for the Boston Public Library, and which were cast at the Williams Foundry. The doors differ from those usually cast, as there were no panels, they having simply large reliefs of separate figures. The subjects were: Music and Poetry; Knowledge and Wisdom; Truth and Inspiration. The doors varied from 1½ to ½ inch in thickness, measured 6 x 11 feet and weighed from 2,600 to 3,000 pounds, and are hung on pivots. The mixture used was 90 per cent. copper, 7 per cent. tin and 3 per cent.



BRONZE STANDARD.

spelter. The sculptor has been at work designing the doors for some fifteen years and the foundry work has taken a year.

THE PORTEOUS PORTABLE TILTING FURNACE.

The number of new types of furnaces which have appeared upon the market during the past year have been such that one has begun to believe that there is hardly any end to them. Many deserve praise, while others are of a nature which renders their use somewhat doubtful in the brass foundry. The John Porteous Mfg. Co., of Cincinnati, Ohio, have brought out a furnace which is the most novel in design of any which have been invented in the past year. In this furnace one of the greatest obstacles met with in the use of the tilting furnace—that of getting the metal to the molds—has been obviated.

This furnace is similar in design to the previous types of "barrel" tilting furnace—i. e., the furnace is mounted upon trunnions, so that it may be readily tilted. In the previous furnaces of such a character, however, the furnace has invariably been stationary, so that the metal was necessarily poured into a ladle and from there into the mold. In the melting of alloys, such as yellow brass, this method has been open to the objection that, in order that the metal will not chill in the ladle and be sufficiently hot when it is poured into the casting, the temperature of the metal in the furnace, before it is poured, is required to be very much higher than necessary, with the consequent loss of spelter and bad metal from overheating. The objection is particularly marked in the instance of small castings which require metal of a much higher temperature than that which is to be poured into large castings.

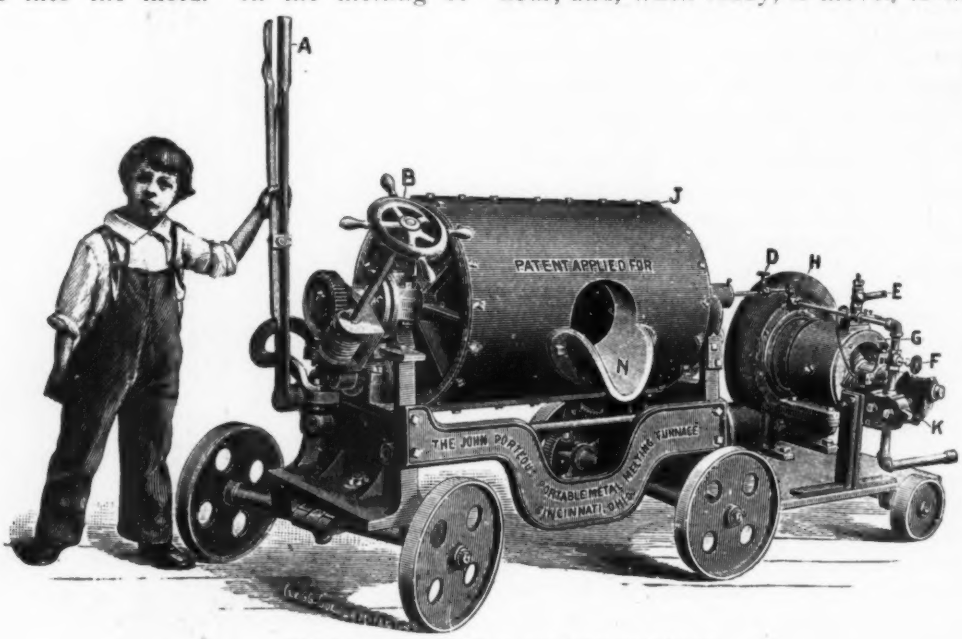
The John Porteous Manufacturing Company has solved the problem by making a furnace which, while embodying all the features of the tilting furnace type heretofore used, may be moved around the foundry from mold to mold. This is accomplished by the simple method of putting the furnace on wheels.

The furnace is shown in the cut accompanying this article, and the principle may be readily seen. The fuel used is either crude oil or gas, natural or artificial. Ingenious devices enable the operator to control the pouring with great ease, and the whole appliance may be readily moved from place to place. As far as the cost of operating is concerned, the following tables will demonstrate the low nature of the fuel consumption. These figures are given out by the makers, and represent actual tests made from comparison with crucible melting:

Minimum cost of melting 5,400 lbs. in crucibles.		Cost with Porteous Furnace.	
Coke	$5.00	Oil	$4.50
Crucibles	5.00	Labor (1 man and helper, operating 4 furnaces, 600 lbs. capacity per hour)	1.00
Labor (1 man and helper)	8.00	Loss of metal, 1¼% @12½c.	8.44
Loss of metal, 5%@ 12½c.	33.75		
	$51.75		$13.94

The advantage, therefore, of the Porteous furnace over crucibles in the melting of 5,400 lbs. of metal is $37.81, or a net reduction of seven-tenths of a cent per lb.

A heat may be taken out of this furnace every hour, and, when ready, is moved to the mold and the metal poured. In addition to use in the brass foundry this furnace may be used for burning rail joints, brazing, tempering and hardening of steel and asphalt repair work. Those who are desirous of improving their foundry equipment should investigate the merits of the Porteous furnace.



PORTEOUS PORTABLE TILTING FURNACE.

MOISTURE IN MOLDING SAND.

The question of a standard of moisture in molding sand is being agitated by some of the large foundrymen. The agitation appears to have begun in New England. The freight rates on molding sand to New England ports is about $1.75 per ton, and the foundrymen do not desire to pay freight on water. A shipment is cited as containing 27 per cent of water. The sand has even been found of the consistency of soft mud, which, of course, will show a much higher moisture percentage.

The agitation is rightly commenced, as there is no reason why a foundryman should be expected to pay freight and molding sand price for water. It is claimed that the captains of the coasting vessels, which bring the sand, purposely leave the hatches off in order that the water may enter the hold of the vessel. They can then increase their tonnage.

THE CASTING OF ALUMINUM SCRAP FOR ROLLING.

As there is a large amount of aluminum sheet scrap on the market and which is known as "skeleton" scrap (i. e. on account of blanks having been punched out of it) there are many users of aluminum who often desire to re-melt this scrap and pour into the form of plates for rolling again into sheet. The price which is obtained for this skeleton scrap is such that there is considerable leeway left for profit in this direction could such a process be carried out by the ordinary melter.

Let it be said upon the start that the re-melting of aluminum scrap for rolling into sheet cannot be satisfactorily done. Many have tried it but have failed. The aluminum can be melted and poured into the plate and one of excellent appearance may be obtained, just as good, in fact, as those obtained from the makers, but when an attempt is made to roll the plate it cracks so badly that no good sheet metal can be obtained from it. Attempts at various heats, complicated molds, or fluxes, always result the same—the plate cracks in rolling. Such a condition may seem almost paradoxical when it is known that brass or similar alloy may be recast and rolled into sheet with good results. But let us take coper for an example and it will be appreciated, if tried, that the same condition of affairs exists as it does in that of re-melting and casting aluminum. Take, for instance, some sheet coper which has rolled perfectly, melt it in crucibles under charcoal, and pour into plates for rolling. It will be found that the plates crack every time and that no good sheet can be obtained from them.

The cracking of the copper is easily explained. Every time copper is melted a certain amount of oxide is produced. This oxide is immediately dissolved by the copper and one cannot tell by the appearance whether there is any oxide present or not; the surface looks the same with or without it. Now this oxide which has dissolved is no more malleable than so much clay, and the more that is dissolved in the copper the less readily it will roll. A slight amount, however, does not affect the malleability to a large extent, but the coper free from oxide is much more malleable than that which contains a small amount. In melting in crucibles in the ordinary manner sufficient oxide is formed to prevent the copper from rolling. The use of fluxes or refining by the means used in refining copper, this oxide is removed and pure metal obtained which will roll into sheet perfectly.

Pure aluminum acts in the same manner as copper, that is it oxidizes readily when melted but, opposite to that of copper, the oxide does not dissolve in the molten metal. This oxide, like that of tin or zinc, mingles with the metal. In tin or zinc the oxide is so much lighter than the pure metal that it floats to the top of the metal as dross and may be readily skimmed off, but in the case of aluminum it is quite different. Aluminum is a light metal *and the oxide is actually heavier than the metal itself*. This may seem a statement which is difficult to believe, but it is, nevertheless, true. Oxide of aluminum has a specfic gravity of 3.9, while that of aluminum is only 2.5. It will readily be seen, therefore, that the oxide, instead of floating to the top sinks to the bottom and cannot be skimmed off. Now herein lies another paradox. The oxide appears to become entangled with metal as it goes down and so possesses about the same specific gravity as the metal itself; just a trifle heavier, perhaps, so that it does not float to the top.

As the skeleton sheet scrap is melted there is so much surface exposed to oxidation that the amount which is formed is quite large. This oxide, then, mingles with the metal and, when poured into the mold, oxide and metal go together and form an apparently homogeneous mass. The oxide being white is not apparent and, to all appearances, is not present. When the plate is rolled, therefore, the oxide prevents the cohesion of the particles of aluminum and so the metal cracks. Were it possible to prevent this formation of oxide, then good rolling mill plates could be made.

In the case of coper, charcoal reduces to some extent the oxide in the copper and certainly, if applied freely, prevents the formation of it. Not so, however, in the case of aluminum, as oxide of aluminum is not reduced by carbon. Charcoal, therefore, is no advantage in the melting of aluminum and is really more of a detriment than otherwise, as it mingles with the metal and is difficult to skim off. Fluxes do not seem to be of any advantage in melting the sheet scrap as there is so much surface present that air cannot be excluded.

BRAZING METAL.

There seems to be more or less inaccuracy existing about the requirements of a metal to stand brazing. Perhaps it will interest some of our readers if a short description of brazing metal is given. The chief requirement of a good brazng metal is that it shall not crack nor melt during the brazing operation. Ordinary yellow brass falls short of this requirement and composition does also. Both these metals, as ordinarily made, will not stand brazing without cracking.

A good yellow brass brazing metal is composed of 3 parts of copper and 1 of spelter. No tin or lead should be added, as both these metals tend to make the alloy red-short. This mixture is used for the manufacture of brazed brass tubes and may be employed equally as well for sand castings. A little tin is not particularly injurious if it does not exceed one or two per cent., but unless this mixture is too soft its use is not to be recommended.

This three and one mixture will give a metal widely different for the melting point of the brazing solder (half spelter and half copper), so that there is no danger of the brazing metal melting during the operation. For a red brazing metal a mixture consisting of 88 parts of copper, 10 of spelter, and 2 of tin may be used. No lead should ever be put into brazing metal, even though the machinist may grumble about the cutting qualities of the metal, as it renders the metal red-short.

LARGE BRONZE CONTRACTS.

Probably the largest contract ever let for the bronze work of a private residence is the work being executed by The Henry Bonnard Bronze Company, 430 West Sixteenth street, New York, for the palatial home of Senator Clark, Seventy-seventh street and Fifth avenue, New York city. The weight of metal which has already been put on the roof of the house is 280,000 pounds, comprising dormer windows, cartouches, ridge rolls, garlands with decorative bronze work and a handsome tower in cast bronze. In the interior bronze will be used for the railings, chandeliers, statuary, etc., and the art founders report that this bronze contract will reach the half million dollar mark before it is completed.

Another large contract secured by The Henry Bonnard Bronze Company is the work for the Pennsylvania Capitol Building, at Harrisburg, Pa. This contract calls for even more metal than that of the residence of Senator Clark and will comprise handsome bronze doors, standards, interior decorative bronze work, historic statuary, etc. Mr. Eugene F. Aucaigne, who is managing director of The Henry Bonnard Bronze Company, has charge of the above contracts. He has an experience of twenty-five years in the art metal business.

A NEW FORM OF WET GRINDER.

In the use of grinders, particularly those for grinding, finishing or sharpening tools, instruments or other devices, it is a necessity in order to obtain the best results and to prevent drawing the temper or softening, impairing or changing the nature of the metal or material of which the tool is formed that the wheel have applied to its active surface water or other liquid which will keep the face wet or in a condition to prevent the generated heat from injuring the metal operated upon. It is likewise desirable that the wheel or stone, when not in use, should not be in contact with the water. The liquid should drain off from the wheel so that it may be kept in as dry a state as possible.

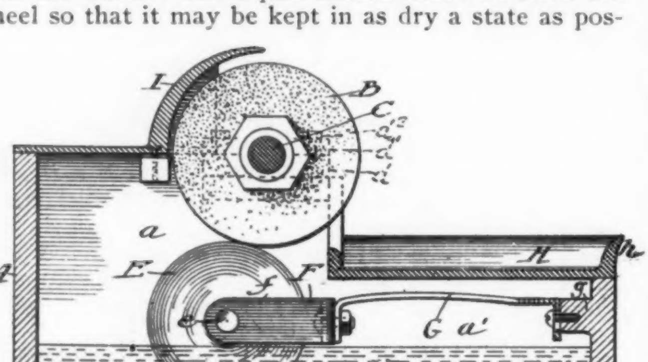


FIG. 1.

If it is allowed to remain in the water so a portion of it is immersed in a vat or tank underneath the wheel, then the texture of the wheel will be changed and that portion which has remained in the water will become softer and wear away more quickly and the wheel run "out of true." Such a condition is known to mechanics, and a wheel which wabbles is a source of much annoyance.

A novel form of wet grinder which obviates the above difficulty has been invented by John J. Rexroth, of Chicago, Ill., and which is herewith illustrated. By referring to Fig. 1 a cross section of the apparatus

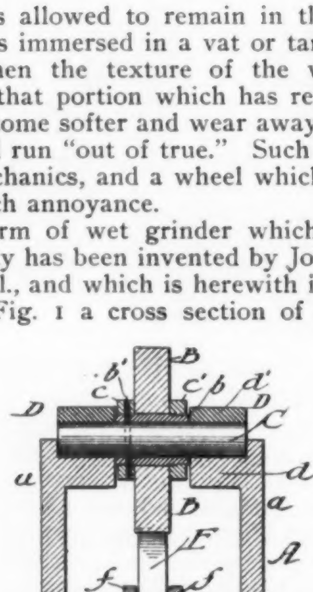


FIG. 2.

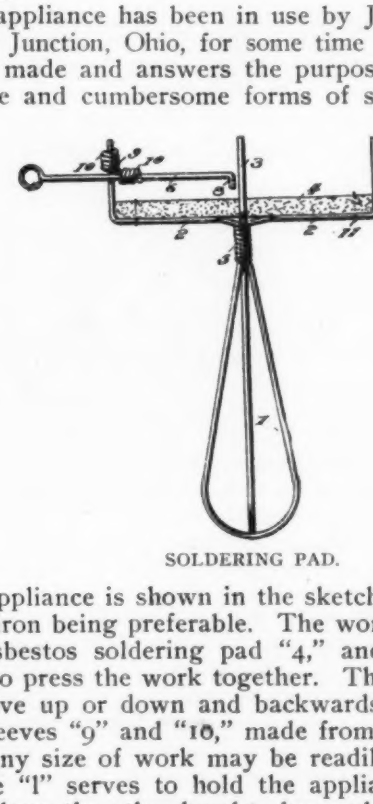
may be seen. B is the emery or similar wheel to be used for grinding, and is run in the usual manner. Underneath, and running in a bath of water or other liquid required, is another wheel which bears directly against the periphery of the emery wheel. The second wheel may be made of any suitable material, and is about half immersed in the water. This wheel is held by a spring G, which serves to hold it against the emery wheel with constant and uniform pressure, even though the diameter of the latter may have been reduced by repeated abrasion.

It will readily be seen that, inasmuch as the emery wheel does not touch the water that it does not become soaked, and hence remains perfectly uniform in texture, however long it may remain when not in use. When the wheel is used the water is applied to the surface by the second wheel, and prevents the heating of the material being operated upon. A shield I, placed back of the emery wheel serves to deflect the water thrown off by centrifugal motion and return it to the tank below.

A CHEAP AND NOVEL SOLDERING PAD.

The soldering of small articles requires some means of holding the parts together in as close contact as possible, so that the members cannot move when the heat is applied. The closer the pieces to be soldered are brought together the better the job and the more invisible is the joint. One method of doing this is to bind the pieces together with iron wire, but such a method is not only difficult to accomplish on some classes of work, but is impossible on very small articles.

An appliance has been in use by J. E. Whitten, of Mingo Junction, Ohio, for some time which may readily be made and answers the purpose as well as expensive and cumbersome forms of soldering clamps.



SOLDERING PAD.

The appliance is shown in the sketch, and is made of wire, iron being preferable. The work is placed upon the asbestos soldering pad "4," and the clamp "6" used to press the work together. This clamp is made to move up or down and backwards or forwards by the sleeves "9" and "10," made from twisted wire, so that any size of work may be readily received. The handle "1" serves to hold the appliance in the hand and allows the other hand to be used for manipulating the blow-pipe. Although any size wire may be used, No. 12 B. & S. gauge is an excellent size, as it forms a sufficiently stiff material for the purpose, even after it has been heated, and, consequently, softened.

Messrs. Aron Hirsch & Sohn, Halberstadt, Germany, give out the following figures of the German consumption of foreign copper for the months of January to June, 1904. The comparison is made with the same period of the year 1903 and 1902:

	1904. Tons.	1903. Tons.	1902. Tons.
Import	56,316	43,688	41,52[illegible]
Export	4,063	5,380	4,48[illegible]
Consumption	52,253	38,308	37,03[illegible]

DYNAMOS FOR ELECTROPLATING.

There can be no doubt that the art of electroplating is gradually advancing from a business largely carried out by rule of thumb to one where the scientific principles underlying the operations are more clearly understood, at least among the more progressive men in the plating business. The increasing use of electrical measuring instruments, such as voltmeters and amperemeters, among platers is a convincing proof of this statement. In order, however, that the best results be obtained with a minimum expenditure of electrical energy, it is necessary that the dynamo, the mainspring of a plating establishment, be so constructed as to be adapted to the work which it is called upon to do.

As plating dynamos run in the majority of cases without the supervision of a trained electrician, one of the first requirements in their construction is that they should be built simple and compact. All parts of their construction which are liable to wear out and to need replacement should be made strictly interchangeable, so that repairs can be made in the minimum amount of time and with a minimum of expense. It is also of the greatest importance that the machines be made strong and durable, and of ample proportions, so that they are able to stand a great deal of neglect and abuse, as they are often placed in an environment which is not exactly conducive to their welfare. In order to need as little supervision as possible, provision should also be made for their automatic and continuous lubrication, care being taken that the bearings are of ample proportions. The machines should also be able to run without sparking when a change of load occurs, without its being necessary to shift the brushes. As it occurs occasionally in the plating practice that accidental short-circuiting at the plating tanks takes place, subjecting the machines to severe strains on account of sudden overloads, provision should be made in their construction to prevent them from being injured when accidents of this kind happen.

One of the most important parts of electroplating dynamos is the commutator. It should be of ample size, with sufficient copper to make the current density very low. The strips should be well insulated from each other by mica, and so arranged that they cannot become loose and cause the brushes to jump. When the latter takes place it occasions a considerable amount of sparking, with its consequent evils, namely, excessive wear of the commutator and the brushes. A free circulation of the air through the commutator and the armature should also be provided for cooling purposes. It is of course essential for machines that run at such low voltage as plating machines do, and which, especially in the larger sizes, furnish a large amperage, that this heavy current be taken off with a minimum loss in resistance. A careful attention to the construction of the brushes is therefore absolutely essential. It is necessary that they be of sufficient size and number so that they are enabled to carry the full current with as little rise in temperature above that of the surrounding air as possible. Woven wire brushes have proved quite suitable in this respect, as they reduce the wear on the commutator by retaining lubrication, and require very little attention.

This feature of little rise in temperature of the brushes above the surrounding air is of course of considerable practical importance, and very essential, inasmuch as less attention is required to keep the commutator and brushes in good condition and prevent excessive wearing, when the oil does not become overheated and thus loses its lubricating properties. A further requirement in the construction of plating machines is that the adjustment of the brushes can be performed in a simple manner and in the shortest possible time, and that the brush holders be so constructed as to clamp the brushes very firmly and to insure good contact.

The proper construction of the armature is also an important factor. In machines of a well-known type the armature core is made up of sheets of the best annealed iron, and is firmly held in place by iron bands. All parts are thoroughly ventilated, ducts being provided for the purpose, which lead from the center of the core to the circumference. The bar wound type of armature is used, and it is claimed that it is well adapted for this class of machinery and forms a practically indestructible winding. It reduces the danger of burn-outs caused by accidental overloads of the machine, and is not likely to be injured by rough handling. The winding is heavily insulated, and connected at the ends by copper ribbons. It is inserted in an insulated slot cut in the core, and is entirely below the surface. In case of accident to one or more bars they can be easily removed without disturbing the remainder of the winding.

The larger machines for electroplating purposes are usually furnished with a separate generator to excite the field. In such machines the load sometimes varies between very wide limits, owing to the removal or introduction of work in the electroplating tanks. If the machine were self-excited, this would require constant manipulation of the rheostat to keep the voltage constant, while with a separately excited machine the voltage will remain practically the same. In the event of any other source of direct contact being available, of course connection can be made with it and a separate exciter dispensed with.

A type of machine which is sometimes seen is the so-called double voltage machine, which has two commutators, one at each end of the armature. The armature has two distinct windings, each of which is connected to its own commutator. It is thus possible to connect the two windings in series and get double the voltage of a single winding, or to connect them in parallel and get double the amperage. Five or more volts per commutator is said to be the usual practice, machines of 7½, 16 and 30 kilowatts having been built of this type. Double commutators are also often used on larger machines to facilitate the taking off of the large currents. A machine of this type, built by a well-known firm for delivering 4,000 amperes at 6 volts, has eight poles of wrought iron, cast welded into the ring. The poles have a special form of shoe, so designed as to prevent the field flux from being distorted by the back magnetization of the armature. Thus the diameter of commutation remains constant, and it is not necessary to shift the brushes with changes of the load. The armature of this machine is assembled on a spider, with suitable provision for cooling.

The tendency in the construction of modern plating machines is toward machines which run at a low or moderate speed, are of simple construction, and the weight of which per unit of output is low.

Concluding this brief and necessary incomplete review of various points to be considered in the construc-

tion of plating dynamos, a few remarks on the location of such dynamos may be added. They should, of course, if anywhere near possible, be placed in a dry and cool place, which ought to be kept scrupulously clean. It is necessary in order to avoid losses from resistance of the copper to place them as near as possible to the plating tanks. They should, however, when placed in the plating room, be surrounded by a well-built, light partition, so as to prevent dust and gases from getting access to them. If this is not done the life of the machines may be shortened greatly, and their efficiency and economy in running considerably reduced. On no account should they be placed in such a position that they may be attacked by gases from the tanks. That they should be placed also on a good and substantial foundation, and their vibration should as much as possible be avoided, is also a self-evident requirement, if they are to render good service, but one which it is unfortunately too often neglected to comply with in practice, to the detriment of the machine and pecuniary loss to the plater.

There is, however, no doubt that as electrical principles are becoming to be better understood by the average plater, the formerly much abused and neglected dynamo will receive that intelligent supervision which it requires to do its best work.

THE PLATING OF FLOWERS, INSECTS, ETC., WITH METALS.

Insects, flowers, or any other non-metallic objects may be plated with any kind of metal that can be deposited from a solution by the electric current. To do this it is only necessary to render the article a conductor of electricity, and this means obtaining a film of metal upon the surface. One might naturally think that this metal could not be obtained without recourse to the current, but such is not the case. The metallization, if such it may be called, is accomplished by means of a solution in a very simple manner, the idea being to obtain a metallic film on the object, however small the amount of metal deposited may be, so as to render it a conductor for the current of electricity to be used. As long as the metal is coherent and the particles connected without break, nothing more is required. After once this metal is deposited and the object rendered a conductor of electricity, any amount of additional metal may be piled up on the surface by the usual method of plating.

Let us take for example a flower, the most difficult of this kind of work. In order to obtain the metal on the surface the process is carried out as follows: A weak solution of nitrate of silver in water is made. About 1 part of nitrate of silver to 50 parts of water. The flower is dipped in this solution until thoroughly soaked, and the excess allowed to drain off. A large bell glass is obtained and of sufficient height to cover the flower. A solution of yellow phosphorus in bisulphide of carbon is now made by dissolving the phosphorus in the bisulphide. This can be accomplished by placing the phosphorus in a bottle and pouring the bisulphide on it and allowing to remain a short time. phosphorus must be kept and cut under water.

A little of this solution is placed in a watch glass under the bell glass and allowed to remain in it along with the flower. The phosphorus volatilizes and reduces the silver to metallic silver, and so covers the surface of the flower with metallic silver. The material is now ready for the coppering bath or other solution upon which it is desired to deposit the metal.

The nitrate of silver may be dissolved in alcohol, if desired, and is perhaps to be preferred, as alcohol evaporates much more quickly than water and leaves the nitrate on the surface sooner without destroying the texture of the flower.

SILVERING WITHOUT AN ELECTRIC CURRENT.

In the silver plating industry it is often desired to locally and quickly plate a portion of the article. For instance, in the case of britannia metal or similar ware which has been engraved after plating. To be sure, in the best class of work plating without a battery will be scarcely thought of, but in the cheaper class of goods the problem must often be solved.

A satisfactory preparation may be made which will give a good coating of silver by simple rubbing of the material on the article, and there are many instances, no doubt, in which such a preparation is useful. It may be made as follows, viz.: Silver is dissolved in nitric acid and the solution diluted with water. Common salt is now added until all the silver is precipitated or thrown down. This precipitate of chloride of silver is now filtered and washed several times with water in order to wash out the acid. This chloride of silver is dissolved in exactly the right amount of cyanide of potash solution. A solution of cyanide of potash is now added until one-third of the whole solution, and next grape sugar to an amount equal to one-quarter of the weight of the silver employed. The whole is now made into a paste with whiting and used. To silver plate the article or portion of it the paste is simply rubbed on with a piece of chamois. A good coat of silver may be obtained by its use.

ARTIFICIAL RUBIES FOR THE MANUFACTURING JEWELER.

Artificial rubies are now being made in Europe in a shape which may result to the advantage of the manufacturing jeweler. The following consular report indicates that they may soon be actual competitors of the natural product. Artificial rubies are made by a process of the chemist Verneuil, by melting a mixture of clay and oxide of chromium at an even temperature of several thousand degrees. The two substances are carefully placed above each other in layers so as to prevent cracking in the crystallized mass.

It is stated that Verneuil finally succeeded in producing an artificial ruby weighing 5 pounds, which had a value of about $600. From this price it may be judged that the product is not first class, and probably just pays the costs of manufacture. In order to produce the exceedingly high temperatue which is indispensable for success, Verneuil uses a blast of oxhydrogen gas, which acts directly on the mass from the top. The hardness of the ruby is the result of quick cooling caused by sudden interruption of the blast of oxyhydrogen. The artificial ruby is said to be very pure and brilliant, possessing all the physical properties of natural rubies. It can be cut, and takes a very fine polish. In view of these assertions it seems singular that artificial rubies have no higher value, especially as the natural article is so exceedingly high-priced at present.—*Richard Guenther, Consul-General, Frankfort, Germany.*

The U. S. War Department Bureau of Insular Affairs has issued a second booklet on its Philippine Exposition at the St. Louis Fair. The new booklet is based on the Exposition as it is to-day.

A ROLLING MILL FOR THE CHINESE MINT.

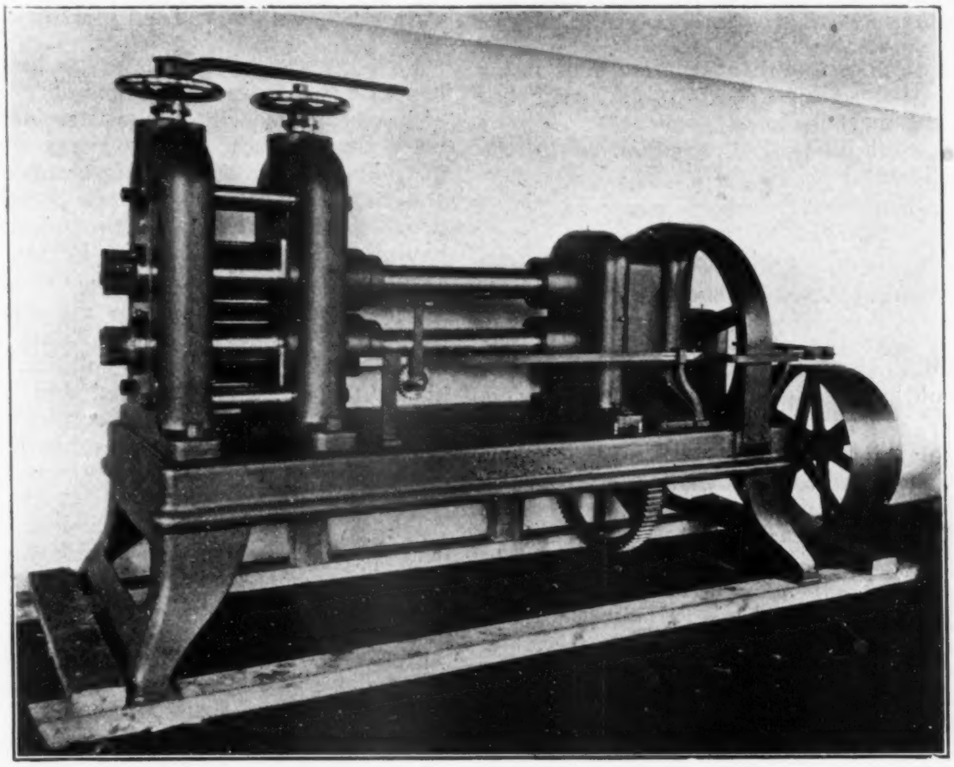
It is a fact not generally known that China has its own establishment for the manufacture of coins, and among the machinery are some of design fully equal to those of the mints of the more enlightened countries. This statement is true of the rolling mills which are used for rolling the strips from which the coin blanks are cut, and one of the most recent additions consists of a rolling mill made by the Blake & Johnson Co., of Waterbury, Conn., the well-known builders of brass working machinery.

This mill, herewith illustrated, is designed to take rolls up to 10 in. by 15 in., and was built from an entirely new design and pattern. The gears, pinions and housings were all figured for strains, and the mill is considered by experts to be one of the most perfect which has ever been designed. All bearings upon which there is much wear have been bronze bushed, and the rolls run in gun metal boxes. The proportions of the rolls next to the surface of the rolls is as accurate as can be proportioned. The gears and pinions all have cut teeth, and the pinions themselves are all made of steel. Nothing but the best iron is put into the mill.

The rolls are of hardened Krupp steel, a material which has stood the test of time and which has yet to be equaled for the purpose. The hardening of steel rolls is a matter in which Messrs. Blake & Johnson stand unsurpassed, and it scarcely need be said that the proper hardening of a steel roll is undoubtedly the most difficult task which is ever encountered. The roll must be of the exact requirements, otherwise it will not stand the test. It may be added that Blake & Johnson guarantee their rolls, an indication which will readily demonstrate that they understand their business.

Chilled rolls may also be used in the mill, and for certain classes of work answer well. Steel rolls, however, are far more desirable when a fine surface is desired upon the metal. Chilled rolls, however well made, are apt to contain pin or sand holes. Although such imperfections may not be apparent when the rolls are first used, subsequent grinding often uncovers them, to the ruin of the roll. The high cost, of course, is the only thing against the steel roll, and for the smaller classes of work is to be recommended.

Although this mill was built for mint work, it is equally applicable for any other requirement, such as jewelers' work, watch case metal and any class of thin or narrow stock.



ROLLING MILL FOR THE CHINESE MINT.

CHAIN INDUSTRY OF GERMANY.

During 1903 there was an increased demand from foreign countries for claims from German factories, enabling them to again employ the hands which had been discharged for lack of work.

Competition by machine-made chains and chains welded by electricity tended to lower the price of forged chains, although the quantity used did not decrease. The trade in crane and ship chains remained about the same during the first half of the year in spite of the labor strike, which lasted nearly three months. During the last half of the year a very noticeable slack set in, which still continues, chiefly because of lack of activity in navigation, so that hardly any orders are received from harbor cities.

As a result of the strike, during which factories in the city of Iserlohn, the principal chain-manufacturing center of Germany, were entirely shut down, foreign competitors received a good share of the orders, and much of the trade thus acquired is still held by them—*From United States Consul Langer, Solingen, Germany.*

During the first four months of 1904 the Transvaal mined 1,192,514 ounces of gold worth $24,651,143. If the same rate of production is maintained throughout the year the yield for 1904 will be at least $77,864,000.

CORRESPONDENCE DEPARTMENT

In this Department we will answer questions relating to the non-ferrous metals and alloys. Address THE METAL INDUSTRY, 61 Beekman St., New York

Q.—A brass worker wishes the following receipts: Pickle for cast brass work; dip for sheet or spun metal, and the ingredients of a potash solution.

A.—A good pickle for brass work consists of 5 gallons of water to which 2 quarts of oil of vitriol has been added. The pickle works more rapidly if hot. The dip commonly used for brass work consists of equal parts of nitric acid and oil of vitriol, to which a small amount of common salt is added. The potash solution contains nothing but potash and water, and is made by dissolving potash in hot water. As potash of commerce varies somewhat in strength, it is immaterial that exact proportions be used, and the amount of water can be increased to suit the case. See our advertising columns for makers of high grade potash.

Q.—A maker of phosphor bronze wishes to know the composition of the alloy known as "B" phosphor bronze sold on the market.

A.—This alloy contains no lead, and consists of the following ingredients:

Copper	89.75 per cent.
Tin	10.00 per cent.
Phosphorus	0.25 per cent.

The mixture should contain no zinc.

Q.—Subscriber says that he has attempted to put the verde-antique finish on manganese bronze without success, and would like to be informed how it may be accomplished.

A.—The difficulty of obtaining a verde-antique finish on manganese bronze in the usual manner is from the fact that the alloy contains aluminum, which prevents the formation of the green carbonate of copper which is necessary for the desired result. The best way to accomplish this finish on manganese bronze is by means of a lacquer in which a little carbonate of copper (very finely ground) is stirred. This material is then painted on the surface and the exposed portions of the metal rubbed off if desired. The hollow portions of the article may be painted with this lacquer, to which a little lampblack has been added to darken it.

By the use of this lacquer and judgment many excellent tints and results may be obtained. It is extensively used for iron and similar cast work, and is much cheaper than the old method of putting the verde antique finish on work.

Q.—A brass founder desires a formula for a brazing metal to be cast in sand which will stand a steam pressure of 500 to 1,500 lbs. and braze well.

A.—A brazing metal must be free from lead to stand brazing. A mixture of three parts of copper and one of spelter forms an excellent alloy for this purpose. One or 2 pounds of tin to 100 lbs. of metal may be added to harden the metal, but is not recommended unless necessary. A red brazing metal may be made of 88 parts of copper, 10 parts of spelter and 2 parts of tin. Ordinary steam metal, if the lead is left out, may also be brazed, and, in fact, any red metal free from lead. The lead is what does the harm.

Q.—A good mixture for babbitt metal is desired.

A.—A genuine babbitt metal may be made of 88 parts of tin, 8 parts of antimony and 4 parts of copper. A very cheap babbitt metal may be made of 80 parts of lead, 15 parts of antimony and 5 parts of tin.

Q.—A plater wishes to know if there is any improved methods of depositing metal on a non-metallic surface other than the usual plumbago process.

A.—The use of bronze powder in place of plumbago is an improvement which certainly deserves mention. As the object of the plumbago is to render the surface a conductor of electricity, so the metallic bronze powder answers admirably, as it is a much better conductor than the plumbago. The copper colored powder is the best, as it is a better conductor of electricity than the brass colored material.

Q.—A plater says that he has attempted to deposit copper on lace in the following manner. He says: "I have commenced to deposit copper on lace and have been troubled by the slowness of the deposit. I metallize with nitrate of silver in alcohol and water, and then expose to the fumes of sulphuretted hydrogen. Is the slowness of the deposit caused by not having amperage enough? I use Hanson's & Van Winkle dynamo, No. 2, in the right way.

A.—Your trouble lies in the use of sulphuretted hydrogen. This gas forms a black sulphide and not metal on the lace. Use a solution of phosphorus in bisulphide of carbon instead and you will have no trouble. You cannot expect to get the current through the lace when there is no metal there to conduct it.

Q.—A manufacturer of hollow ware says that he is troubled with pin holes in britannia ware castings. These pin holes are not completely filled in the plating, but the various solutions used fill the holes and ooze out after the metal is finished. The appearance is, therefore, ruined. All kinds of dips were tried, but without success, and the surface was also plated with nickel and tin, but without success.

A.—The difficulty is apparently caused by the small amount of oxide which becomes entangled in the metal as it goes into the mold. This is the oxide of tin and, of course, leaves places in the metal in the form of pin holes or of larger volume. If such pin holes form in the surface there is no way of removing them. No plating will fill them up. The most satisfactory method of preventing them is to use a very small amount of phosphor-tin in your mixture. This will reduce the oxide and give as clear a surface to the metal as is possible to obtain. As the metal will run as clearly as water, there can be no dross to give you the trouble which you have had.

Q.—We are asked for methods of determining copper, tin, zinc and lead in brass.

A.—This process is purely a chemical one and cannot be described in our journal in a way which the reader could understand. We might describe moulding or electroplating, but the reader could not appreciate the manner in which it is done unless he actually saw it carried out. In all these arts the manipulation comprises by far the greater part and it would hardly avail anything to attempt to go into the matter.

Q.—A brass founder says: "In one of your recent numbers we noticed a formula for making a metal that would stand from 95,000 to 100,000 pounds per square inch tensile strength. We have tried many times to cast a straight bar, but have never been able to obtain over 43,000 pounds. After the metal was poured we fed same with wire. After being pulled apart there was a black streak running down the middle. Kindly inform us what our difficulty is.

A.—It is impossible to say whether you have made your mixture properly without seeing the bar, but on the assumption that you have, your difficulty lies in two things: First, no metals containing aluminum should be stirred or agitated after being once cast. Such a proceeding produces oxide, which renders the metal weak. The other difficulty lies in pouring the metal at too high a heat. Pour as low a temperature as is possible. Of course, a riser is necessary on some work, but not on others. The black streak in the center of the bars is segregation or crystallization, which, of course, produces weakness. There is so much in the proper molding, gating, use of skim gate, heat, that if one has had no experience in casting alloys containing aluminum he will probably run against the difficulties which you have. We know that the strength given in our article can be obtained because we have seen it produced repeatedly. Of course, small sections give higher tensile strengths than those of large area.

Q.—A metal mixer asks us what will prevent stereotype metal from "falling down" or shrinking after it has been cast. He would like to add some metal to prevent it.

A.—There are two metals which possess non-shrinkable properties. These are bismuth and antimony. Bismuth is preferable to antimony, as it expands considerably on cooling. Alloys of some kinds containing it do not shrink on cooling at all and are used for purposes where a metal is required which will not shrink. Its expense, however, precludes its use in commercial alloys. Were it not for the expense bismuth would be much more widely used than at present.

Antimony prevents, to a certain extent, metals from shrinking and an alloy of lead and antimony shrinks but very little. If tin is present the metal shrinks more than otherwise. It is probable that you cannot ameliorate your condition very much, as there is need for a little tin in the alloy. You might try increasing the antimony a little and leaving out the tin. We know of no other way in which this can be accomplished. The addition of bismuth, unless in amounts which the price would prohibit, would be of no material advantage.

Q.—A jewelry manufacturer states that he is having trouble in working the black nickel solution. The solution consists of 1 gallon of water, 1 pound of white arsenic and 1 pound of cyanide. A lead anode is used. The solution plates black, but the work turns gray in a short time.

A.—You are getting a very fine deposit of arsenic on your work which changes to white arsenic by oxidation. We do not understand where your black nickel comes in because you make no mention of the nickel solution. Use nickel anodes and the regular nickel solution to which your solution above may be added and you will get a deposit which will stand.

READERS' OPINIONS.

Correspondence is solicited from all of our readers on subjects relating to the founding, finishing, rolling and plating of the non-ferrous metals and alloys. Name and address must be given, though not necessarily for publication. Address THE METAL INDUSTRY, 61 Beekman street, New York.

To the Editor of THE METAL INDUSTRY:

I take interest in your correspondence column. You have had several inquiries where platers have had trouble with cast iron (or other casting) shooting out and staining on brass plating, etc., but your answers are not sufficient. Your prolonged hot water is good, but after this the articles will have to be heated in an oven or on a hot metal plate. Work of any kind will not stain from sand holes, etc., after heating. I had the same trouble on brass plated malleable iron or cast iron or steel, but since heating the work everything is all right.

To obtain a nice chocolate color on copper, take two parts of salammoniac to one of the sulphate of potash of the regular oxidizing solution. A variety of colors from statue bronze to black can be obtained according to the time of immersion. The solution can be used warm to advantage, but not hot.

DAN WITTIG.

BOOK REVIEW.

The Polishing and Plating of Metals is the title of a new book devoted to the plater's art. It is written by Herbert J. Hawkins, a practical and experienced plater, and is published by Hazlitt & Walker of Chicago. The book relates to plating in all its branches and takes up the subject from the very beginning, one of the first chapters being devoted to points on hygiene in the plating room. The polishing room its machinery and management, acids, dips and pickles, the arrangement and management of the plating room are described in detail and fully illustrated, and all from the viewpoint of the latest shop practice. There are a number of chapters on the special finishes and appliances and the book will no doubt prove a valuable addition to the library of the practical plater.

Charles E. Conner, connected with the general management of the Waterbury Brass Company, Waterbury, Conn., was recently run over and killed by a train at Saybrook Junction, Conn. Although Mr. Conner was young (he was born November 15, 1876), he was much appreciated by the higher officials of the company, who were about to make him general superintendent of the sheet, rod and wire mills of the Waterbury plant.

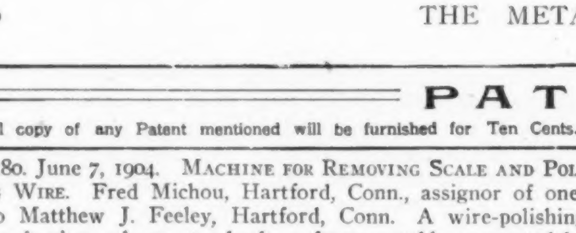
Philip W. Moen, formerly general manager and vice-president of The Washburn & Moen Manufacturing Company, of Worcester, Mass., and later vice-president, director, and the Eastern manager of The American Steel and Wire Company, died suddenly at his summer residence, Shrewsbury, Mass., on September 12, aged 47 years. Mr. Moen was instrumental in introducing the manufacture of copper wire into the Washburn & Moen works and early saw the future of this product.

The Society of Chemical Industry held a very satisfactory meeting in New York City from September 7th to the 12th. William H. Nichols was elected president.

PATENTS

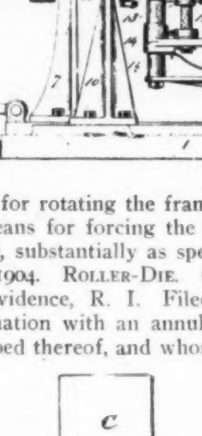
A full copy of any Patent mentioned will be furnished for Ten Cents. Address THE METAL INDUSTRY, 61 Beekman Street, New York

762,180. June 7, 1904. MACHINE FOR REMOVING SCALE AND POLISHING WIRE. Fred Michou, Hartford, Conn., assignor of one-half to Matthew J. Feeley, Hartford, Conn. A wire-polishing machine having a base, standards, a frame rotably supported by



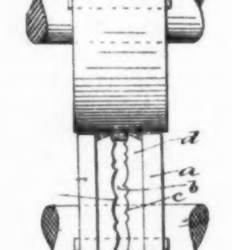
the standards, means for rotating the frame, polishing-pieces held by the frame, and means for forcing the polishing-pieces toward the axis of the frame, substantially as specified.

761,792, June 7, 1904. ROLLER-DIE. Charles H. Such and Thomas Heath, Providence, R. I. Filed Oct. 28, 1902. In a roller-die, the combination with an annular channel of an ornament recessed in the bed thereof, and whose marginal outline con-



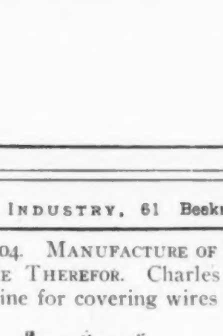
stitutes a cutting edge, of a transversely-inclined annular surface extending downwardly and from the cutting edge toward the face of the die.

763,330, June 21, 1904. ELECTRIC FURNACE. Charles P. E. Schneider, Le Creusot, France. Filed Dec. 22, 1903. In combination, an electric-furnace chamber, electrodes therein, and means for adjusting the same whereby they may be lowered and raised



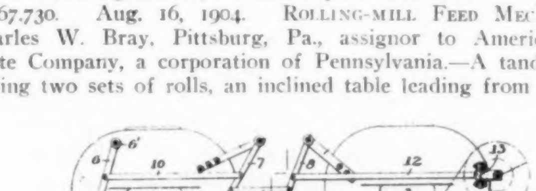
in the chamber, a pipe leading from and returning to the bottom of said chamber adapted for circulating molten metal, and a transformer linking said pipe and adapted to heat molten metal therein.

762,735, June 14, 1904. MANUFACTURE OF INSULATED OR COVERED WIRES AND MACHINE THEREFOR. Charles Martin, Nottingham, England. In a machine for covering wires and the like, the com-



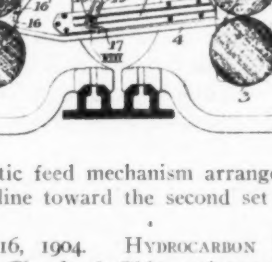
bination of a lapping mechanism for applying a layer of yarn to said wire, means for folding a strip of rubber around said wire, another set of lapping mechanism for applying a layer of yarn over said rubber strip, and knitting mechanism for applying a knitted covering thereto, substantially as described.

767,730. Aug. 16, 1904. ROLLING-MILL FEED MECHANISM. Charles W. Bray, Pittsburg, Pa., assignor to American Tin Plate Company, a corporation of Pennsylvania.—A tandem mill having two sets of rolls, an inclined table leading from the first



set, and an automatic feed mechanism arranged to transmit the metal from the incline toward the second set of rolls; substantially as described.

767,509. Aug. 16, 1904. HYDROCARBON BRAZING-FURNACE. Charles F. Warner, Cleveland, Ohio, assignor to Frank B. Many, Cleveland, Ohio.—In a portable hydrocarbon brazing-furnace, a furnace structure comprising a suitable base, an oil-reservoir fixed



upon said base and having a lateral flange at its top, a hearth-pan and posts supporting said pan and fixed to said lateral flange of the reservoir, substantially as described.

TRADE NEWS

When You Have Any Trade News of Interest Send It to THE METAL INDUSTRY, 61 Beekman Street, New York.

Richard & Co.'s metal store, of Boston, Mass., are selling a new brand of spelter known as "Brass Special."

The Sheet Metal Novelty Company have been incorporated at Tiffin, O., with a capital of $500, to manufacture metal novelties.

The Manitowoc Aluminum Novelty Company, Manitowoc, Wis., report that business is fine and the prospects are very good for the coming year.

By an addition to their factory building the Oakville Company, Oakville, Conn., manufacturers of wire and metal goods are increasing their capacity.

The United Metal Manufacturing Company, 186 Worcester street, New York, are distributing a desk blotter which advertises their gas fixture fittings.

The Duplex Stamping Company may locate in Vermilion, O., and manufacture screen door hinges, latches, cupboard catches and a large line of specialties.

Owing to the increase of their business, the Union Hardware and Metal Company, Los Angeles, Cal., have increased their capital stock from $600,000 to $1,500,000.

The Grasselli Chemical Company, of Cleveland, Ohio, solicit inquiries for their prime Western spelter, which is manufactured from selected high grade Missouri ores.

The U. S. Reduction Company, of Chicago, Ill., report that they manufacture by a special process all grades of aluminum ingots and are in a position to sell such ingots at a low figure.

The Joseph Dixon Crucible Company, Jersey City, N. J., issued a special number of their publication, *Graphite*, in September, containing interesting information about Dixon's Silica Graphite Paint.

The Central Metal and Supply Company, Baltimore, Md., advise us that they are erecting a four-story warehouse 44 x 90 at 611 E. Lombard street, which they expect to occupy on January 1, 1905.

A new foundry building 60 x 101 will be erected by the Lumen Bearing Company, of Buffalo, N. Y. It will be equipped with the Coburn trolley system for carriers. No new machinery will be required.

The Dings Electro-Magnetic Separator Company, of Milwaukee, report an increasing foreign demand for their separators. Their orders for the last month included one from England and one from France.

Edward Gerbic and Ernest Lange have just started a new brass foundry at 700 Kinnickinnick avenue, Milwaukee, Wis., and will do a general line of job work. The firm will be known as the Eagle Brass Foundry.

The Goodwin & Kintz Company, of Winsted, Conn., manufacturers of metal goods, are sending out their new catalogue No. 24, which describes their complete line of candelabra and candlesticks, bronzes, clocks, vases, etc.

Foundry waste, such as brass skimmings, grindings, sweepings, dross and washing mud are bought by Emil Schneider, 298 South street, Newark, N. J. Mr. Schneider is also a manufacturer of soldering fluids, salts and brazing powder.

The Liberty Manufacturing Company, Waterbury, Conn., have been incorporated with a capital of $5,000 to manufacture gas portables and appliances. The incorporators are Frank P. Noera, Albert W. Nichols and John P. Kellogg.

The New Jersey Zinc Company report that the statement that their plant on the Hackensack Meadows, N. J., was destroyed by fire is incorrect. The fire burned the frame boiler house, but in two days the furnace was running and is still in blast.

R. W. Conklin, who was formerly connected with E. F. Byrne, has located in the Park Row Building as selling agent for the Granby Mining and Smelting Company, of St. Louis, Mo. The company are the manufacturers of the Granby pure pig lead and spelter.

The Metal Ware Manufacturing Company, Bridgeport, Conn., have been incorporated with a capital of $24,000 to manufacture metal and wire specialties under their own patents. George Sanger, Ella T. Sanger and Thomas F. Cooney are the incorporators.

Two illustrated catalogues have been issued by the Gong Bell Manufacturing Company, East Hampton, Conn. One catalogue relates to the line of gong door bells, trip gong bells, hand, call and tea bells. The other catalogue is devoted to the company's line of bell toys.

A contract has been given the A. Garrison Foundry Company of Pittsburg, Pa., for the building of three new 28-inch sheet mills for the Pittsburg Reduction Company. These mills will be installed at New Kensington, Pa., and will be used for rolling aluminum sheets.

Tests of Ajax plastic bronze on the Government railways of France have proven so satisfactory that the Ajax Metal Company have closed negotiations with a concern in Paris for the manufacture on a royalty basis of the various patented Ajax alloys and bearing metals.

The Wire Goods Company, Worcester, Mass., is sending out a folder describing their universal double jointed chain and fixtures, which are made in solid brass, brass plated or nickel plated. The chain is ornamental, strong and flexible and is especially adapted for plumbers' use.

Kitselman Bros., Muncie, Ind., manufacturers of wire nails, etc., have increased their capital stock to $500,000. The firm own several factories in the United States and have warehouses in Canada and Mexico. They will spend $25,000 in improvements in their Muncie plant.

Merritt & Co., of 1024 Ridge avenue, Philadelphia, Pa., have bought property with buildings on Front and Arch streets, Camden, N. J., into which at an early date they expect to move both of their present plants. They manufacture structural and ornamental wire and iron work and brass grilles.

The Goulds Manufacturing Company, Seneca Falls, N. Y., have bought about 40 acres of land, which will be used for extending their present plant. It is possible that the company's entire works will be built on their new site, which is located along the tracks of the New York Central Railroad.

The National Clock Company, with a capital stock of $100,000, has been organized at Cleveland, O., with A. D. Ray, president; F. M. Baxter, vice-president and secretary; E. W. Livensparger, treasurer. The company will manufacture a new employers time register clock and the factory will be established in Cleveland.

The property of the New Britain Knitting Company has been bought by P. & F. Corbin, New Britain, Conn. The Corbin people state that their new property will be used for the exten-

sion of the business of the American Hardware Corporation. P. & F. Corbin are also erecting a new annealing kiln building

The name of the foundry of Brooks Brothers Brass Company has been changed to the Liberty Brass Foundry, the ownership and management remaining the same. The works have been considerably enlarged to take care of their increasing trade and the management report that the outlook for business is very good.

The Westinghouse Company, of St. Petersburg, Russia, has in the Palace of Transportation at the St. Louis Fair, a pavilion containing a characteristic Russian exhibit. The formal withdrawal of the Russian Government from participation in the fair makes the Westinghouse pavilion headquarters for everything Russian.

The Buckeye Aluminum Company, of Doylestown, Ohio, report that their business is growing at a very brisk rate and they are receiving more orders than they can fill. The firm are getting out several new articles, including a new cooker and steamer. Altogether the company report the outlook very bright for high grade aluminum ware.

The Mitchell Vance Company, of New York city, are putting up a building of their own adjoining their present quarters at 24th street and 10th avenue. The new factory will be of six stories and will be better equipped for making the productions of the company, which include gas and electric fixtures. They expect to move in about November 1.

The Rockwell Engineering Company, New York city, report that the users of their oil melting furnaces are constantly reporting better results and the company have made a number of second installations of larger sized furnaces. The number of orders placed for the Rockwell Furnace since it has been put on the market is very encouraging to the builders.

Albert T. Salt, formerly with the Gorham Manufacturing Company, and who has had many years of practical experience, has established the Atlas Silver Foundry at 136 Pine street, Providence, R. I. Mr. Salt's specialties are jewelers' castings of every description. He will also make castings in silver, German silver, britannia metal, bronze and aluminum.

The St. Lawrence River Power Company, 71 Broadway, New York, have issued an attractive illustrated book relating to their power canal, located on the St. Lawrence River, at Massena, N. Y., and a description of the town itself. The company invites correspondence with all who are interested in the subject of electric power for electrochemical and metallurgical plants.

The Globe Brass Company, successors to the Globe Brass Works, Detroit, Mich., have been incorporated with a capital stock of $100,000. The incorporators are George C. Huebner, Frank W. Parsons and Louis P. Lots. The company operate a plant at 13 Macomb street, but intend to build a larger factory of their own elsewhere. The company manufacture brass goods for steam, air, gas and water.

A new company incorporated in the State of Iowa is the American Wire Cloth Company, of Clinton, with a capital stock of $100,000. The company are building a large factory and expect to be able to put screen cloth and other wire specialties on the market in time for the season of 1905. C. F. Curtis is president; James Peterson, vice-president; M. J. Gates, treasurer; E. E. Reynolds, secretary and manager.

The Rockford Brass Works, Rockford, Ill., are working on a catalogue which will be ready for distribution about January 1st, 1905, and which will describe their complete line of plumbing and heating supplies. The company are recognized jobbers in these supplies and will make an effort to get outside trade in their surrounding territory. The officers of the company are: D. E. Trahern, president; H. R. Trahern, treasurer, and F. D. Keeler, secretary.

The Niagara Falls Brass Works have been incorporated at Niagara Falls, N. Y., with a capital of $20,000. The company will manufacture locomotive castings, journal bearings, aluminum bronze castings and bronze bearings. A plant will be established in Whitney avenue, and new buildings erected later. John Lebherz, formerly with the Frick Works, at Waynesboro, Pa., will be superintendent of the shops. J. N. Frantz & Co. are the proprietors.

The Ansonia Copper and Sheet Iron Company, of Cincinnati, O., will erect a one-story brick and stone shop near the C. H. & D. R. R., the cost of which when completed will be $20,000. The new plant will be entirely up-to-date and will measure 196 x 198 feet, equipped with the latest machinery for the construction of distillery copper work. When finished it will be one of the largest and finest plants in the United States for the manufacture of metal work for distilleries.

THE METAL INDUSTRY has mentioned a number of times the importance of using pure cyanide of potassium in the electroplating bath, particularly in silver plating. We are informed by The Charles E. Sholes Company, of 25 Broad street, New York, that they are in a position to offer the finest quality of cyanide packed in zinc lined cases, at as low prices as any on the market. The company also sells a variety of chemicals which are used in electro-plating and metal working plants.

The Standard Machinery Company, successors to Mossberg & Granville Manufacturing Company, of Providence, R. I., have issued four catalogues entitled respectively as "Press," "Rolling Mill," "Drop Press," and "Miscellaneous," each catalogue being devoted to the machinery which is made under this classification. The catalogues indicate that the Standard Company make a large assortment, particularly of machinery which is used by the workers in the non-ferrous metals and alloys.

The B. J. Riley Manufacturing Company is the title of a new company in Newark, N. J., organized to engage in the manufacture of metal goods in all its branches, with factory and offices at 249 New Jersey R. R. avenue. B. J. Riley is president, and E. C. Baldwin, secretary and treasurer. Both have been until very recently connected with the Riley-Klotz Manufacturing Company, and their predecessors for the past 35 and 20 years, Mr. Riley having been the superintendent and E. C. Baldwin the eastern representative.

Howard & Morse, 45 Fulton street, New York, have been equipping some of the largest New York hotels and public buildings with their rotary ventilator, which is driven by electric motors, steam or gas engines. The ventilator is specially suitable for metal industry plants, removing the fumes from electroplating establishments or the foul air in brass working shops. When the ventilators are put in plating shops, the fan blades are made of copper, phosphor bronze or aluminum, according to the resistance to corrosion desired.

The American Nickeloid and Manufacturing Company, of Peru, Ill., who are manufacturers of nickelized sheet zinc, which is coming into use very rapidly in this country for stamped, plated and polished articles, as the sheet metal does not rust or require subsequent polishing or finishing after stamping, have recently obtained a valuable United States patent, No. 768,818, which they report will enable them to hold their own at the head of the procession in the manufacturing of nickelized sheet zinc.

"What We Do" is the title of an attractive catalogue issued by the Wellman-Seaver-Morgan Company, of Cleveland, Ohio. The catalogue differs from those that are ordinarily issued in being long and narrow, of pocketbook shape and consisting almost entirely of half-tone illustrations of the engineering and manufacturing machinery produced by the company. Also cuts of the plants which have been equipped with their machinery, of which they manufacture a great variety, including cranes, power machinery and reduction machinery.

Metal Prices, October 5, 1904

METALS

	Price per lb.
Tin—Duty Free.	
Straits of Malacca	28.35
Copper, Pig, Bar and Ingot and Old Copper—Duty Free. Manufactured 2½c. per lb.	
Lake	13.00
Electrolytic	12.90
Casting	12.60
Spelter—Duty 1c. per lb.	
Western	5.20
Lead—Duty Pigs, Bars and Old 2⅛c. per lb.; pipe and sheets 2½c. per lb.	
Pig Lead	4.30
Aluminum—Duty Crude, 8c. per lb. Plates, sheets, bars and rods 13c. per lb.	
Small lots	37.00
100 lb. lots	35.00
1,000 lb. lots	34.00
Ton lots	33.00
Antimony—Duty ¾c. per lb.	
Cooksons	7.00
Halletts	6.90
Other	6.50
Nickel—Duty 6c. per lb.	
Large lots	40 to 50
Small lots	50 to 75
Bismuth—Duty Free	$1.5c to $2.00
Phosphorus—Duty 18c. per lb.	
Large lots	.45
Small lots	65 to 75
	Price per oz.
Silver—Duty Free—Commercial Bars	$0.58⅛
Platinum—Duty Free	19.00
Gold—Duty Free	2c.00
Quicksilver—Duty 7c. per lb. Price per Flask.	40.00

Zinc—Duty, Sheet, 2c. per lb.; 600-lb. casks, 6.50 per lb., open, 7.00 per lb.

Tobin Bronze—Rods, Unfinished, 19c.

Tobin Bronze—Rods, Finished, 20c.

PRICE FOR ALUMINUM BRONZE INGOTS.

	Per pound.
2½ per cent	19c.
5 per cent	19½c.
7½ per cent	20½c.
10 per cent	21½c.

Manganese Bronze, Ingots	16½c.
Phosphor Bronze, Ingots	15 to 18c.
Silicon-Copper, Ingots	34 to 36c.

OLD METALS

	Buying.	Selling.
Heavy Cut Copper	11.50c.	12.50c.
Copper Wire	11.25c.	12.00c.
Light Copper	10.00c.	10.11c.
Heavy Mach. Comp.	10.00c.	10.11c.
Heavy Brass	7.75c.	8.50c.
Light Brass	5.75c.	6.50c.
No. 1 Yellow Brass Turnings	6.75c.	8.00c.
No. 1 Comp. Turnings	8.50c.	9.00c.
Heavy Lead	3.95c.	4.05c.
Zinc Scrap	3.75c.	4.25c.
Scrap Aluminum, sheet, pure	22.00c.	25.00c.
Scrap Aluminum, cast, alloyed	16.00c.	20.00c.
Old Nickel	15.00c.	25.00c.
No. 1 Pewter	19.00c.	20.00c.

PRICES OF SHEET COPPER

SIZES OF SHEETS.		96oz. & over 75 lb. sheet 30x60 and heavier	64oz. to 96oz. 50 to 75 lb. sheet 30x60	32oz. to 64oz. 25 to 50 lb. sheet 30x60	24oz. to 32oz. 18¾ to 25 lb. sheet 30x60	16oz. to 24oz. 12½ to 18¾ lb. sheet 30x60	14oz. and 15oz. 11 to 12½ lb sheet 30x60
		CENTS PER POUND.					
Not wider than 30 ins.	Not longer than 72 ins.	18	19	19	19	19	20
	Longer than 72 ins. Not longer than 96 ins.	18	19	19	19	19	20
	Longer than 96 ins.	18	19	19	19	19	21
Wider than 30 ins. but not wider than 36 ins.	Not longer than 72 ins.	18	19	19	19	19	21
	Longer than 72 ins. Not longer than 96 ins.	18	19	19	19	19	21
	Longer than 96 ins. Not longer than 120 ins.	18	19	19	19	20	22
	Longer than 120 ins	18	19	19	20	21	
Wider than 36 ins. but not wider than 48 ins.	Not longer than 72 ins.	18	19	19	20	21	23
	Longer than 72 ins. Not longer than 96 ins.	18	19	19	20	22	24
	Longer than 96 ins. Not longer than 120 ins.	18	19	19	21	23	27
	Longer than 120 ins.	18	19	20	22	25	
Wider than 48 ins. but not wider than 60 ins.	Not longer than 72 ins.	18	19	19	20	22	25
	Longer than 72 ins. Not longer than 96 ins.	18	19	19	21	23	28
	Longer than 96 ins. Not longer than 120 ins.	18	19	20	22	25	
	Longer than 120 ins	19	20	21	23	27	
Wider than 60 ins. but not wider than 72 ins.	Not longer than 96 ins.	18	19	20	22	27	
	Longer than 96 ins. Not longer than 120 ins.	18	19	21	24	29	
	Longer than 120 ins.	19	20	22	27		
Wider than 72 ins. but not wider than 108 ins.	Not longer than 96 ins.	19	20	22	25		
	Longer than 96 ins. Not longer than 120 ins.	20	21	23	26		
	Longer than 120 ins.	21	22	24	28		
Wider than 108 ins.	Not longer than 132 ins.	22	23	25			
	Longer than 132 ins.	23	24	27			

Rolled Round Copper, ⅜ inch diameter or over, 21 cents per pound. (Cold Drawn, Square and Special Shapes, extra.)

Circles, Segments and Pattern Sheets three (3) cents per pound advance over prices of Sheet Copper required to cut them from.

All Cold or Hard Rolled Copper, 14 ounces per square foot and heavier, one (1) cent per pound over the foregoing prices.

All Cold or Hard Rolled Copper, lighter than 14 ounces per square foot, two (2) cents per pound over the foregoing prices.

Cold Rolled and Annealed Copper, Sheets and Circles, wider than 17 inches, take the same price as Cold or Hard Rolled Copper of corresponding dimensions and thickness

All Polished Copper, 20 inches wide and under, one (1) cent per pound advance over the price for Cold Rolled Copper.

All Polished Copper, over 20 inches wide, two (2) cents per pound advance over the price for Cold Rolled Copper.

Planished Copper, one (1) cent per pound more than Polished Copper.

Cold Rolled Copper prepared suitable for polishing, same prices and extras as Polished Copper.

Tinning Sheets, on one side, 2½c. per square foot.

For tinning both sides, double the above price.

For tinning the edge of sheets, one or both sides, price shall be the same as for tinning all of one side of the specified sheet.

Metal Prices, October 5, 1904

COPPER BOTTOMS, PITS AND FLATS

Net Cash Prices.

14 oz. to square foot, and heavier, per lb.................. 23c.
Lighter than 10 oz.................................... 24c.
10 oz. and up to 12 oz................................ 26c.
12 oz. and up to 14 oz. to square foot, per lb............... 20c.
Circles less than 8 in diam., 2c. per lb. additional.
Circles over 13 in. diam., are not classed as Copper Bottoms.
Polished Copper Bottoms and Flats, 1c. per lb. extra.

PRICE LIST FOR ROLL AND SHEET BRASS

Prices are for 100 lbs. or more of sheet metal in one order.
Brown & Sharpe's Gauge the Standard.

Common High Brass	in.	in.	in.	in.	in.	in.	in.	in.	in.	in.
Wider than and including	2 12	12 14	14 16	16 18	18 20	20 22	22 24	24 26	26 28	28 30
To No. 20 inclusive..	.22	.23	.25	.27	.29	.31	.33	.36	.39	.42
Nos. 21, 22, 23 and 24	.22	.24	.26	.28	.30	.32	.34	.37	.40	.43
Nos. 25 and 26........	.23	.24½	.27	.29	.31	.33	.35	.38	.41	.44
Nos. 27 and 28........	.23	.25	.28	.30	.32	.34	.36	.39	.42	.45

Add ½ cent per lb. additional for each number thinner than Nos. 28 to 38, inclusive.

Add 7 cents per lb. for sheets cut to particular lengths, not sawed, of proportionate width.

Add for polishing on one side, 40 cents per square foot; on both sides, double this price.

Brazing, Spinning and Spring Brass, 1 cent more than Common High Brass.

Extra Quality Brazing, Spinning and Spring Brass, 2 cents more than Common High Brass.

Low Brass, 4 cents per lb. more than Common High Brass.

Gilding, Rich Gold Medal and Bronze, 7 cents per lb. more than Common High Brass.

Discount from List, 30 per cent.

PRICE LIST FOR BRASS AND COPPER WIRE

BROWN & SHARPE'S GAUGE THE STANDARD.	Com. High Brass	Low Brass	Gilding Bronze and Copper
All Nos. to No. 10, Inc..................	$0.23	$0.27	$0.31
Above No. 10 to No. 16..................	.23½	.27½	.31½
Nos. 17 and 18..........................	.24	.28	.32
" 19 and 20.............................	.25	.29	.33
No. 21..................................	.26	.30	.34
" 22....................................	.27	.31	.35
" 23....................................	.28	.32	.36
" 24....................................	.30	.34	.38

Discount, Brass Wire, 30 per cent.; Copper Wire, 40 per cent.

PRICES FOR SEAMLESS BRASS TUBING.

From 1¼ in. to 3½ in. O. D. Nos. 4 to 13 Stubs Gauge, 18c. per lb.
Seamless Copper Tubing, 21c. per lb.
For other sizes see Manufacturers' List.

PRICES FOR SEAMLESS BRASS TUBIN Iron Pipe Sizes.

Iron Pipe size......	⅛	¼	⅜	½	¾	1	1¼	1½	2	2½	3	3½	4	4½	5	6
Price per lb........	26	25	20	19	18	18	18	18	18	18	18	19	20	22	21	25

BRAZED BRASS TUBING

Brown & Sharpe's Gauge the Standard.

	Per lb
Plain Round Tube, ¾ in. up to 2 in., to No. 19, inc.	$0 35
" " " ⅝ " " ¾ " " 19, "	36
" " " ½ " " ⅝ " " 19, "	38
" " " [illegible] " " [illegible] " " 19, "	41
" " " [illegible] " " [illegible] " " 19, "	48
" " " [illegible] " " [illegible] " " 19, "	65
" " " [illegible] " " [illegible] " " 19, "	1 00
" " " [illegible] " " [illegible] " " 19, "	1 50
Smaller than ⅛ inch............................	Special
2 inch to 3 inch, to No. 19, inclusive.........	38
3 inch...	40
Over 3 inch to 3½ inch.........................	45
Over 3½ inch...................................	50

Bronze and copper advance 3 cents. Discount 30 per cent.

PRICE LIST FOR SHEET ALUMINUM

PLATE AND SHEET PRICE LIST.—B. & S. GAUGE.

Prices are for 50 pounds or more at a time. Less quantities, 5 cents per pound additional. Charges made for boxing.

Wider Than... And Including...	*3 in. 12 in. in coils.	6 in. 14 in.	14 in. 16 in.	16 in. 18 in.	18 in. 20 in.	20 in. 24 in.	24 in. 30 in.	30 in. 36 in.	36 in. 40 in.	40 in. 45 in.	45 in. 50 in.	50 in. 55 in.	55 in. 60 in.	Polishing One Side.	Sat. Fin. without Lacquer, One Side.
No. 13 & heavier..	......	42	44	44	44	44	47	47	47	48	48	49	50	2	6
" 14..........	......	42	44	44	44	44	47	47	47	48	48	49	50	2	6
" 15..........	......	42	44	44	44	44	47	47	47	48	48	49	50	2	7
" 16..........	......	42	44	44	44	44	47	47	47	48	48	49	50	2	8
" 17..........	......	42	44	44	44	44	47	47	47	48	48	49	50	3	9
" 18..........	......	42	44	44	44	44	47	47	50	51	51	54	57	3	10
" 19..........	......	42	44	44	44	44	47	48	51	52	52	56	59	4	11
" 20..........	42	44	44	44	44	46	49	50	52	53	53	58	61	4	12
" 21..........	42	46	46	46	46	48	51	52	58	59	62	65	......	5	14
" 22..........	42	46	46	46	48	48	51	55	59	61	64	......	......	5	16
" 23..........	42	46	46	46	48	48	51	57	60	64	......	......	......	6	18
" 24..........	42	46	48	50	50	50	53	59	62	......	......	......	......	6	20
" 25..........	44	47	49	51	51	51	54	61	......	......	......	......	......	7	23
" 26..........	44	47	50	54	54	54	59	......	......	......	......	......	......	8	25
" 27..........	44	48	52	56	56	57	62	......	......	......	......	......	......	10	28
" 28..........	44	48	54	56	57	57	64	......	......	......	......	......	......	11	32
" 29..........	46	49	56	58	60	60	69	......	......	......	......	......	......	13	36
" 30..........	46	50	58	60	64	70	77	......	......	......	......	......	......	15	40
" 31..........	48	52	60	63	68	76	......	......	......	......	......	......	......	17	44
" 32..........	50	54	62	66	74	82	......	......	......	......	......	......	......	19	50
" 33..........	52	56	......	......	......	......	......	......	......	......	......	......	......	21	57
" 34..........	55	60	......	......	......	......	......	......	......	......	......	......	......	25	66
" 35 & 36......	1 67	Not wider than 6 in.	......	......	......	......	......	......	......	......	......	......	......	Polished two sides double above prices.	Satin Finish two sides double above prices.
" 37 & 38......	1 98		......	......	......	......	......	......	......	......	......	......	......		
" 39 & 40......	2 22		......	......	......	......	......	......	......	......	......	......	......		
" .003" to .0015"	2 42		......	......	......	......	......	......	......	......	......	......	......		
Less than .0015"	2 66		......	......	......	......	......	......	......	......	......	......	......		

Additional charge for slitting coiled sheet in widths less than 3 in. and flat rolled sheets in widths less than 6 in.
All columns except the first are for Flat Rolled Sheets.

Discounts as follows are given for sheet orders over 200 pounds.

200 to 1,000 pounds...10 per cent. off list.
1,000 to 2,000 " 10 per cent. and 2 " "
2,000 to 4,000 " 10 " " 3 " "
4,000 pounds and over 10 " " 5 " "

Sheets polished or satin-finished on both sides, double the price for one side.

Price Per Foot of Seamless Aluminum Tubing.

(CHARGES MADE FOR BOXING.)

THICKNESS OF WALL IN STUBS' GAUGE.

Outside Diameter in Inches.	No. 12.	No. 14.	No. 16.	No. 18.	No. 20.	No. 22.	No. 24.		Outside Diameter in Inches.
1-4......	......	......	......	10	9	8	7		1-
5-16......	......	......	......	11	9	8	7		5-1
3-8......	......	......	......	12	9	8	7		3-
1-2......	......	......	17	14	11	9	8		1-
5-8......	......	......	21	16	13	12	......		5-
3-4......	......	......	25	19	16	14	......		3-
7-8......	......	......	28	22	18	16	......		7-
1.........	......	......	30	25	21	19	......		1
1 1-4......	......	......	36	30	25	......	......		......1 1
1 1-2......	......	52	43	35	28	......	......		......1 1
1 3-4......	......	60	50	41	33	......	......		......1 3
2.........	84	68	58	47	37	......	......		2

Discount 20 to 30 per cent.

ALUMINUM

Drawn Rod and Wire Price List.—B. & S. Gauge.

Diameter B.& S.G'ge.	0000 to No.10	No. 11.	No. 12.	No. 13.	No. 14.	No. 15.	No. 16.	No. 17.	No. 18.	No. 19.	No. 20.	No. 21.	No. 22.
Price per lb	$ 38	38¼	38½	0 39	39¼	0 40	40½	0 41	0 42	0 43	0 44	0 47	0 52

200 lbs. to 30,000 lbs., three cents off list.
30,000 lbs. and over, four cents off list.